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carbon containing gas is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.

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27. (Amended) The method of claim 14 wherein said silicon germanium carbon alloy is single crystalline.

28. (Amended) The method of claim 14 wherein said silicon germanium carbon alloy is polycrystalline.

REMARKS

Favorable reconsideration and allowance of the claims of the present application are respectfully requested.

Before addressing the specific grounds of rejection raised in the present Office Action, applicants have amended Claims 1 and 14 in the manner indicated above. Specifically, applicants have amended Claim 1 to positively recite that the claimed method provides a silicon carbon alloy layer having an *oxygen content of less than 1×10^{17} atoms/cc*. Support for this amendment to Claim 1 is found in original Claim 4, which has been canceled herein. The inclusion of the subject matter of Claim 4 into Claim 1 required applicants to amend Claims 12 and 13.

Applicants have also amended Claim 1 to positively recite that the carbon containing gas employed *is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds*. Support for this amendment to Claim 1 is found in original Claim 5, which has also been canceled herein.

Insofar as Claim 14 is concerned, applicants have amended Claim 14 to positively recite that the claimed method provides a silicon germanium carbon alloy layer

having an oxygen content of less than 1×10^{17} atoms/cc. Support for this amendment to Claim 14 is found in original Claim 17, which has been canceled herein. The inclusion of the subject matter of Claim 17 into Claim 14 required applicants to amend Claims 27 and 28.

Applicants have also amended Claim 14 to positively recite that the carbon containing gas employed in the claimed method is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds. Support for this amendment to Claim 14 is found in original Claim 18, which has also been canceled herein.

Since the above amendments to the claims do not introduce new matter into the specification of the instant application, entry thereof is respectfully requested. As required by 37 C.F.R. §1.121, applicants have attached a marked-up copy of claims showing the changes made by the present amendment.

Claims 1-3, 5-7, 9-10, 14-16, 18-20 and 22-25 stand rejected under 35 U.S.C. §102(a) as allegedly anticipated by US Application Publication No. 2002/0160605 A1 to Kanzawa, et al. ("Kanzawa, et al."). Claims 4, 8, 12-13, 17, 21, 27 and 28 stand rejected under 35 U.S.C. §103 as allegedly unpatentable over Kanzawa, et al. in combination with U.S. Application Publication No. 2002/0016085 A1 to Huang, et al. ("Huang, et al."). Claims 11 and 26 stand rejected under 35 U.S.C. §103 as allegedly unpatentable over Kanzawa, et al. and U.S. Patent No. 6,306,211 B1 to Takahashi, et al. ("Takahashi, et al.").

With respect to the anticipation rejection, it is axiomatic that anticipation under §102 requires that the prior art reference disclose each and every element of the

claim to which it is applied. In re King, 801 F.2d 1324, 1326, 231 U.S.P.Q. 136, 138 (Fed. Cir. 1986). Thus, there must be no differences between the subject matter of the claim and the disclosure of the applied prior art reference. Stated another way, the reference must contain within its four corners adequate direction to practice the invention as claimed. The corollary of the rule is equally applicable: The absence from the applied reference of any claimed element negates anticipation. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571, 230 U.S.P.Q. 81, 84 (Fed. Cir. 1986).

Applicants respectfully submit that the method claims of the present application are not anticipated by the disclosure of Kanzawa, et al. Specifically, the applied reference does not disclose an UHV CVD method of forming a silicon carbon alloy layer or a silicon germanium carbon alloy layer having an *oxygen content of less than 1×10^{17} atoms/cc, wherein the carbon present in the alloy layer is from a carbon gas that is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.*

Kanzawa, et al disclose an UHV CVD method of forming crystalline SiGeC using SiH_3CH_3 as the carbon source gas. See, Kanzawa, et al., paragraph 0030, lines 1-3. No other C source gases are mentioned for use with the prior art UHV CVD. Applicants find no disclosure in Kanzawa, et al. of replacing the disclosed SiH_3CH_3 gas with a C source gas that is *selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds*. Applicants respectfully observe that at paragraph 0007 of the Kanzawa, et al. disclosure there is mention using ethylene or acetylene as a C source gas. This disclosure is for a RT-CVD process, not an UHV CVD process. There is no teaching that these C source gas can be used in the prior art UHV CVD process.

Applicants further submit that the claimed methods provide alloy layers that have an oxygen content *of less than 1×10^{17} atoms/cc*. This claimed feature is not disclosed in Kanzawa, et al. Applicants observe that in the anticipation rejection, original Claims 4 and 17, which previously included the claimed oxygen content range, was not part of the anticipation rejection. Since independent Claims 1 and 14 now positively recite that the alloy layer produced has an oxygen content *of less than 1×10^{17} atoms/cc*, the claims of the present application are not anticipated by the disclosure of Kanzawa, et al.

The foregoing remarks clearly indicate that the applied reference does not teach each and every aspect of the claimed invention as required by King and Kloster Speedsteel; therefore the claims of the present application are not anticipated by the disclosure of Kanzawa, et al.

Applicants submit that the claimed methods of the present application are not obvious from the combined disclosures of Kanzawa, et al. and Huang, et al. or Kanzawa, et al. and Takahashi, et al. Specifically, the combination of applied references do not teach or suggest an UHV CVD method of forming a silicon carbon alloy layer or a silicon germanium carbon alloy layer having an oxygen content *of less than 1×10^{17} atoms/cc, wherein the carbon present in the alloy layer is from a carbon gas that is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds*.

Kanzawa, et al. are defective for the same reasons as mentioned above under the anticipation rejection. Applicants thus incorporate those comments herein by reference.

Huang, et al. do not alleviate the defects in Kanzawa, et al. since the applied secondary reference also does not teach or suggest an UHV CVD method of forming a silicon carbon alloy layer or a silicon germanium carbon alloy layer having an oxygen content of less than 1×10^{17} atoms/cc, wherein the carbon present in the alloy layer is from a carbon gas that is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.

Huang, et al. provide a method for forming a SiC layer that is resistant to oxygen diffusion and has a low oxygen content. The low oxygen content layers disclosed in this prior art reference may be formed in situ or ex situ by (i) exposing the SiC film to a plasma of an inert gas to densify the layer and form a passivation surface; (ii) by exposing the SiC layer to a nitriding plasma to form a passivating nitride surface layer; or (iii) by depositing a thin passivation layer on the surface of the SiC film. Thus, the disclosure of Huang requires that a passivating surface layer be formed atop a SiC film in order to have a film having low oxygen content.

In Huang, the low-k SiC film is formed by a plasma CVD process in which the carbon containing source gas is an organosilane. Alternatively Huang, et al. disclose that the SiC layer can be formed by using a silane in combination with methane. Applicants find no disclosure of using the claimed C source gas in Huang, et al. At best, the combined disclosures of Huang, et al. and Kanzawa, et al. would use an organosilane or methane as a C source material.

Applicants further observe that in order to obtain the low oxygen content, Huang, et al. require the presence of a passivating surface layer on the SiC film. Thus, in combining the two references together, as the Examiner has done, one would provide a

passivating surface layer to the SiGeC disclosed in Kanzawa, et al. In the claimed invention, the claimed alloy film has the low oxygen content without the need of a passivating surface layer.

Based on the above remarks, the combined disclosures of Kanzawa, et al. and Huang, et al. do not render the claims of the present application obvious.

Insofar as the other secondary reference is concerned, i.e., Takahashi, et al., applicants submit that Takahashi, et al. do not alleviate the above mentioned defects in Kanzawa, et al. since the applied secondary references also fails to teach or suggest an UHV CVD method of forming a silicon carbon alloy layer or a silicon germanium carbon alloy layer having an oxygen content of less than 1×10^{17} atoms/cc, wherein the carbon present in the alloy layer is from a carbon gas that is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.

Takahashi, et al. provide a method for growing a semiconductor film on a substrate. In the applied reference, source and diluting gases are supplied into the chamber through source and diluting gas supply pipes provided with respective flow meters. In addition, a doping gas is also supplied through an additive gas supply pipe, which is provided with a pulse valve, and a gas inlet pipe into the chamber by repeatedly opening and closing the pulse valve. In this manner, a doped layer is grown epitaxially on the substrate. In this case, a pulsed flow of the doping gas is directly supplied through the pulse valve onto the substrate from the outlet port of a pressure reducer for a doping gas cylinder. As a result, a steeply rising dopant concentration profile appears in a transition region between the substrate and the doped layer, and the surface of the doped layer is planarized.

In the Takashi, et al. disclosure, the source gas is a silane and a hydrocarbon such as propane. Applicants find no disclosure of using the claimed C source gas in Takahashi, et al. At best, the combined disclosures of Takahashi, et al. and Kanzawa, et al. would use an organosilane and propane as a C source material. Applicants further observe that the disclosure of Takahashi, et al. does not specify that the resultant SiC film being deposited has applicants' claimed oxygen content.

Based on the above remarks, the combined disclosures of Kanzawa, et al. and Takahashi, et al. do not render the claims of the present application obvious.

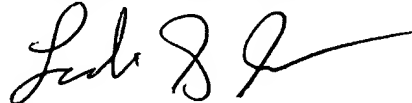
The §103 rejections also fail because there is no motivation in the applied references which suggest modifying the disclosed methods to include the steps of the claimed methods. In particular, none of the applied references teaches or suggests an UHV CVD method of forming a silicon carbon alloy layer or a silicon germanium carbon alloy layer having an oxygen content of less than 1×10^{17} atoms/cc, wherein the carbon present in the alloy layer is from a carbon gas that is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds. Thus, there is no motivation provided in the applied references, or otherwise of record, to make the modification mentioned above. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Vaeck, 947 F.2d, 488, 493, 20 USPQ 2d. 1438, 1442 (Fed.Cir. 1991).

The rejections under 35 U.S.C. §103 have been obviated; therefore reconsideration and withdrawal thereof is respectfully requested. In addition to the foregoing, pursuant to the requirements, applicants also enclose a "**Version with**

Markings Showing Changes Made" to facilitate the Examiner's review of the present amendment.

Thus, in view of the foregoing amendments and remarks, it is firmly believed that the present case is in condition for allowance, which action is earnestly solicited.

Respectfully submitted,



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Enclosure Version with markings

"VERSION WITH MARKINGS SHOWING CHANGES MADE"

IN THE CLAIMS:

Claims 4, 5, 17 and 18, have been cancelled without prejudice or disclaimer, and amend

Claims 1, 12, 13, 14, 27 and 28 have been amended to read as follows:

1. (Amended) A method for forming an alloy layer of silicon carbon on a silicon containing substrate comprising the steps of:

placing a wafer having a single crystalline silicon containing surface into a ultra-high vacuum (UHV) chemical vapor deposition (CVD) chamber;

heating said silicon containing surface to a temperature in the range from about 475°-850°C, and

flowing a silicon containing gas and a carbon containing gas over said silicon containing surface whereby said silicon carbon layer having an oxygen content of less than 1×10^{17} atoms/cc is formed, wherein said carbon containing gas is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.

12. (Amended) The method of claim 1 wherein said silicon carbon alloy is single crystalline [and has an oxygen concentration of less than 1×10^{17} atoms/cc].

13. (Amended) The method of claim 1 wherein said silicon carbon alloy is polycrystalline [and has an oxygen concentration of less than 1×10^{17} atoms/cc].

14. (Amended) A method for forming an alloy layer of silicon germanium carbon on a silicon containing substrate comprising the steps of:

placing a wafer having a single crystalline silicon containing surface into a ultra-high vacuum (UHV) chemical vapor deposition (CVD) chamber;

heating said silicon containing surface to a temperature in the range from about 350°-850°C, and

flowing a silicon containing gas, a germanium containing gas and a carbon containing gas over said silicon containing surface whereby said silicon germanium carbon layer having an oxygen content of less than 1×10^{17} atoms/cc is formed, said carbon containing gas is selected from the group of molecules containing unsaturated double or triple carbon-carbon bonds.

27. (Amended) The method of claim 14 wherein said silicon germanium carbon alloy is single crystalline [and has an oxygen concentration of less than 1×10^{17} atoms/cc].

28. (Amended) The method of claim 14 wherein said silicon germanium carbon alloy is polycrystalline [and has an oxygen concentration of less than 1×10^{17} atoms/cc].